AMENDMENT TO THE CLAIMS:

Claims 1-15. (canceled)

16. (currently amended): A method for detecting the concentration of exhaust gas using a gas sensor which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

calibrating ~~a zero point of~~ a detection output of the gas sensor ~~specifying~~by determining a zero point, which indicates ~~the~~a zero concentration of said specific component, based on a detection output of the gas sensor in atmosphere, and

detecting the concentration of said specific component ~~based on~~ after the ~~calibrated~~ detection output has been calibrated.

17. (currently amended) A method for detecting the concentration of exhaust gas using a gas sensor which detects the concentration of a specific component in a gas discharged from an internal combustion engine, comprising:

calibrating ~~the zero point of~~ a detection output of the gas sensor ~~specifying~~ by determining a zero point, which indicates ~~the~~a zero concentration of the specific component, based on a detection output of the gas sensor obtained on cutting fuel supply to said internal combustion engine for setting the concentration of said specific component in the gas introduced into said gas sensor substantially to zero or to substantially the same level as the atmosphere; and

detecting the concentration of said specific component ~~based on~~ after the ~~calibrated~~ detection output has been calibrated.

18. (currently amended): A method for detecting the concentration of exhaust gases using a gas sensor which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

calibrating ~~the zero point of~~ a detection output of the gas sensor ~~specifying~~by determining a zero point, which indicates ~~the~~a zero concentration of the specific component, based on a detection output of the gas sensor obtained on setting a rich air-to-fuel ratio for said internal combustion engine to reduce said specific component and to set the concentration of said specific component in the gas introduced into said gas sensor substantially to zero or to substantially the same level as the atmosphere; and

detecting the concentration of said specific component ~~based on~~after the ~~calibrated~~ detection output has been calibrated.

19. (currently amended): The method as defined in ~~any one of~~ claim 16, wherein said gas sensor is a NOx sensor.

20. (currently amended) The method as defined in claim 19,

wherein said NOx sensor has a first air gap and a second air ~~gaps~~gap, a first diffusion resistance unit and a second diffusion resistance ~~units~~unit, and a first oxygen ion pump cell and a second oxygen ion pump ~~cells~~cell;

wherein said exhaust gases are diffused via said first diffusion resistance unit into said first air gap, said first oxygen ion pump cell pumping out oxygen from said first air gap so that oxygen in the gas diffused via said first diffusion resistance unit into said first air gap will be of a specified oxygen concentration; and

wherein the gas having the specified oxygen concentration is diffused from said first air gap via said second diffusion resistance unit into said second air gap; NOx is decomposed in said second air gap; said second oxygen ion pump cell pumping out dissociated oxygen ions; and the NOx concentration is detected from a current flowing in said second oxygen ion pump cell.

21. (previously presented): The method as defined in claim 19 wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said zero point is calibrated based on a detection output of said NOx sensor when an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

22. (currently amended): A method for detecting the concentration of exhaust gases using a gas sensor which detects the concentration of a specific component in a gas discharged from an internal combustion engine, comprising:

~~driving~~operating the internal combustion engine under ~~conditions~~a driving condition in which ~~enable~~ the concentration of said specific component ~~to~~can be estimated or in which ~~render~~ said concentration ~~know~~is known;

calibrating a detection output of said gas sensor based on a detection output of said gas sensor under ~~a~~the driving condition for said engine; and

detecting the concentration of said specific component ~~based on~~after the ~~calibrated~~ detection output has been calibrated.

B2 cont'd

23. (original) An apparatus for detecting the concentration of exhaust gases comprising:

a gas sensor detecting the concentration of a specific component in a gas discharged from an internal combustion engine;

driving condition setting means for setting driving conditions for the engine which enable the concentration of said specific component to be estimated or which render said concentration known; and

calibration means for calibrating a detection output of said gas sensor based on a detection output of said gas sensor under said driving conditions as set by said driving condition setting means.

24-38. (canceled)

39. (currently amended): A method for determining NOx concentration in a measurement gas, under a varying condition of the NOx gas concentration in the measurement gas in the course that the measurement gas is allowed to travel through a flow channel facing a ceramic body having an electrically controllable conducting state of oxygen ions, comprising:

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(1) introducing the measurement gas into the flow channel;

(2) ~~forming in said flow channel a residual gas having a NOx concentration different from that before entrance into said flow channel by~~ extracting an oxygen gas from the measurement gas of the step (1) through the ceramic body to outside of the flow channel, such that a NOx-concentrated residual gas, which has a NOx concentration different from that of the measurement gas, is formed in the flow channel;

(3) dissociating NOx of ~~said~~the NOx-concentrated residual gas into nitrogen and oxygen by applying a voltage across electrodes formed on the ceramic body;

(4) measuring an electric current flowing through the ceramic body between the electrodes, ~~said~~the electric current being generated by the electrochemical action of the oxygen dissociated from NOx in step (3);

(5) determining a basic NOx concentration of the measurement gas based on the electric current measured in step (4); ~~and~~

(6) ~~measuring an output in step (4) introducing atmospheric air, and~~ calibrating ~~zero point of said~~the basic NOx concentration by determining a zero point, which indicates a zero concentration of NOx, based on measuring an electric current flowing through the ceramic body between the electrodes when atmospheric air is introduced into the flow channel.

B2 cont'd

40-41. (canceled).

42. (new): A method for detecting the concentration of exhaust gas using a gas sensor having a detection output which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the specific component in atmospheric air to obtain a zero point, which indicates a zero concentration of the specific component,

calibrating the detection output of the gas sensor based on said zero point, and

detecting the concentration of said specific component in exhaust gas based on said calibrated detection output.

43. (new): A method for detecting the concentration of exhaust gas using a gas sensor having a detection output which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the specific component upon cutting fuel supply to said internal combustion engine so as to set the concentration of said specific component in gas introduced into the gas sensor substantially to zero or to substantially the same level as in atmospheric air to obtain a zero point, which indicates a zero concentration of the specific component,

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calibrating the detection output of the gas sensor based on said zero point, and

detecting the concentration of said specific component in exhaust gas based on said calibrated detection output.

44. (new): A method for detecting the concentration of exhaust gas using a gas sensor having a detection output which detects the concentration of a specific component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the specific component upon setting a rich air-to-fuel ratio for said internal combustion engine to set the concentration of said specific component in gas introduced into said gas sensor substantially to zero or to substantially the same level as in atmospheric air to obtain a zero point, which indicates a zero concentration of the specific component,

calibrating the detection output of the gas sensor based on said zero point, and

detecting the concentration of said specific component in exhaust gas based on said calibrated detection output.

45. (new): The method as claimed in claim 42, wherein said gas sensor is a NOx sensor.

B2 Contd

46. (new): The method as claimed in claim 45,

wherein said NOx sensor has a first air gap and a second air gap, a first diffusion resistance unit and a second diffusion resistance unit, and a first oxygen ion pump cell and a second oxygen ion pump cell;

wherein said exhaust gases are diffused via said first diffusion resistance unit into said first air gap, said first oxygen ion pump cell pumping out oxygen from said first air gap so that oxygen in the gas diffused via said first diffusion resistance unit into said first air gap will be of a specified oxygen concentration; and

wherein the gas having the specified oxygen concentration is diffused from said first air gap via said second diffusion resistance unit into said second air gap; NOx is decomposed in said second air gap; said second oxygen ion pump cell pumping out dissociated oxygen ions; and the NOx concentration is detected from current flowing in said second oxygen ion pump cell.

47. (new): The method as claimed in claim 45, wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said detection output is calibrated while an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

B2 cont'd

48. (new): A method for determining NOx concentration in a measurement gas, under a varying condition of the NOx gas concentration in the measurement gas in the course that the measurement gas is allowed to travel through a flow channel facing a ceramic body of a gas sensor having an electrically controllable conducting state of oxygen ions, comprising:

(1) introducing atmospheric air into the gas sensor;

(2) determining NOx concentration of the atmospheric air with said gas sensor to obtain a zero point, which indicates a zero concentration of the NOx;

(3) calibrating the gas sensor based on said zero point,

(4) introducing a measurement gas into the flow channel;

(5) forming in said flow channel a residual gas having a NOx concentration different from that before entering into said flow channel by extracting oxygen gas from the measurement gas of step (4) through the ceramic body to outside of the flow channel;

(6) dissociating NOx of said NOx-concentrated residual gas of step (5) into nitrogen and oxygen by applying a voltage across electrodes formed on the ceramic body;

(7) measuring electric current flowing through the ceramic body between the electrodes, said electric current being generated by the electrochemical action of the oxygen dissociated from NOx in step (6); and

(8) determining NOx concentration of the measurement gas, based on the electric current measured in step (7) of said calibrated gas sensor.

B2 cont'd

49. (new): A method for detecting the concentration of exhaust gas using a NOx sensor having a detection output which detects the concentration of a NOx component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the NOx component in atmospheric air to obtain a zero point, which indicates a zero concentration of the NOx component,

calibrating the detection output of the NOx sensor based on said zero point, and

detecting the concentration of said NOx component in exhaust gas based on said calibrated detection output.

50. (new): A method for detecting the concentration of exhaust gas using a NOx sensor having a detection output which detects the concentration of a NOx component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the NOx component upon cutting fuel supply to said internal combustion engine so as to set the concentration of said NOx component in gas introduced into the NOx sensor substantially to zero or to substantially the same level as in atmospheric air to obtain a zero point, which indicates a zero concentration of the NOx component,

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calibrating the detection output of the NOx sensor based on said zero point, and

detecting the concentration of said NOx component in exhaust gas based on said calibrated detection output.

51. (new): A method for detecting the concentration of exhaust gas using a NOx sensor having a detection output which detects the concentration of a NOx component in a gas discharged from an internal combustion engine, the method comprising:

detecting the concentration of the NOx component upon setting a rich air-to-fuel ratio for said internal combustion engine to set the concentration of said NOx component in gas introduced into said NOx sensor substantially to zero or to substantially the same level as in atmospheric air to obtain a zero point, which indicates a zero concentration of the NOx component,

calibrating the detection output of the NOx sensor based on said zero point, and

detecting the concentration of said NOx component in exhaust gas based on said calibrated detection output.

52. (new): The method as claimed in claim 49,

wherein said NOx sensor has a first air gap and a second air gap, a first diffusion resistance unit and a second diffusion resistance unit, and a first oxygen ion pump cell and a second oxygen ion pump cell;

wherein said exhaust gases are diffused via said first diffusion resistance unit into said first air gap, said first oxygen ion pump cell pumping out oxygen from said first air gap so that oxygen in the gas diffused via said first diffusion resistance unit into said first air gap will be of a specified oxygen concentration; and

wherein the gas having the specified oxygen concentration is diffused from said first air gap via said second diffusion resistance unit into said second air gap; NOx is decomposed in said second air gap; said second oxygen ion pump cell pumping out dissociated oxygen ions; and the NOx concentration is detected from current flowing in said second oxygen ion pump cell.

53. (new): The method as claimed in claim 49, wherein said NOx sensor is mounted downstream of a NOx occlusion catalyst and wherein said detection output is calibrated while an air-to-fuel ratio is temporarily set to a rich side for cleaning NOx occluded in said NOx occlusion catalyst.

54. (new): A method for detecting the concentration of exhaust gases using a NOx sensor which detects the concentration of a NOx component in a gas discharged from an internal combustion engine, comprising:

operating the internal combustion engine under a driving condition in which the concentration of said NOx component can be estimated or in which said concentration is known;

B2 cont'd

calibrating a detection output of said NOx sensor based on a detection output of said NOx sensor under the driving condition for said engine; and

detecting the concentration of said NOx component after the detection output has been calibrated.

55. (new): An apparatus for detecting the concentration of exhaust gases comprising:

a NOx sensor detecting the concentration of a NOx component in a gas discharged from an internal combustion engine;

driving condition setting means for setting driving conditions for the engine which enable the concentration of said NOx component to be estimated or which render said concentration known; and

calibration means for calibrating a detection output of said NOx sensor based on a detection output of said NOx sensor under said driving conditions as set by said driving condition setting means.

B2 Cont'd

56. (new): A method for determining NOx concentration in a measurement gas, under a varying condition of the NOx gas concentration in the measurement gas in the course that the measurement gas is allowed to travel through a flow channel facing a ceramic body of a NOx sensor having an electrically controllable conducting state of oxygen ions, comprising:

(1) introducing atmospheric air into the NOx sensor;

(2) determining NOx concentration of the atmospheric air with said NOx sensor to obtain a zero point, which indicates a zero concentration of the NOx;

(3) calibrating the NOx sensor based on said zero point,

(4) introducing a measurement gas into the flow channel;

(5) forming in said flow channel a residual gas having a NOx concentration different from that before entering into said flow channel by extracting oxygen gas from the measurement gas of step (4) through the ceramic body to outside of the flow channel;

(6) dissociating NOx of said NOx-concentrated residual gas of step (5) into nitrogen and oxygen by applying a voltage across electrodes formed on the ceramic body;

(7) measuring electric current flowing through the ceramic body between the electrodes, said electric current being generated by the electrochemical action of the oxygen dissociated from NOx in step (6); and

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(8) determining NOx concentration of the measurement gas, based on the electric current measured in step (7) of said calibrated gas sensor.